5 Energy Efficiency Indices

Energy efficiency is an important aspect of Wisconsin's strategy to provide energy services to its citizens and businesses. These energy efficiency indices aid in tracking Wisconsin's progress in using energy more efficiently.

In 2007, total energy use per $1,000 of gross state product increased 5.4 percent.

Energy efficiency activities in the residential and commercial sectors are measured primarily by recording the number of buildings that have received professional audits, installed energy efficiency improvements or were certified as meeting energy efficiency building codes.

In 2007, state energy use per gross square foot in state-owned buildings decreased 1.5 percent.

Total carbon dioxide emissions from energy production increased this year by 1.5 percent. Total emissions are up 22.5 percent from 1990, the international benchmark year for greenhouse gas emissions.

Indices of Wisconsin Energy Efficiency 1970-2007[r]

(Millions of Btu)

These indices can be useful in evaluating energy efficiency trends in Wisconsin. Total energy use per dollar of gross state product, and electricity use per dollar of gross state product reversed their downward trends. In 2007, Wisconsin commercial employment continued to increase (0.53 percent, page 126) as did energy use per employee (4.9 percent). Industrial energy use per $1,000 manufacturing value added decreased 2.9 percent and is 41.1 percent lower than in 1970. Agricultural energy use per acre remained constant in 2007.

Year	Total Energy Use Per $1,000 GSP[a]	Electric Energy Use Per $1,000 GSP[a]	Residential Energy Use Per Capita[b]	Commercial Energy Use Per Employee[d]	Industrial Energy Use Per $1,000 Manufacturing Value Added[a,c]	Agricultural Energy Use Per Acre
1970	13.4	0.99	74.0		11.1	1.4
1975	12.7	1.11	74.2		9.0	1.6
1980	11.1	1.12	75.7		7.7	2.0
1985	10.2	1.15	71.3		7.7	2.1
1990	10.0	1.18	72.2	163.5	8.0	2.0
1995	9.6	1.17	78.3	168.0	7.5	2.0
2000	8.4	1.08	75.6	161.8	6.8	2.0
2001	8.2	1.09	75.0	161.1	7.3	2.0
2002	8.2	1.09	77.1	163.2	6.9	2.0
2003	8.1	1.07	77.9	163.8	6.7	2.0
2004	7.9	1.05	75.7	155.5	7.2	2.0
2005	7.8	1.08	76.7	157.3	7.1	2.2
2006	7.4	1.05	71.5	153.4	6.8	2.2
2007[p]	**7.8**	**1.08**	**76.9**	**161.6**	**6.6**	**2.3**

[a] Manufacturing Value Added and Gross State Product in 2007 dollars, deflated with Gross Domestic Product Implicit Price Deflator.

[b] Not adjusted for yearly variations in temperature.

[c] Value added data for Wisconsin not available. Value added estimated using U.S. and Wisconsin trends.

[d] Per Employee Data not available prior to 1990 due to change in coding from SIC to NAICS – see page 126.

[r] Revised.

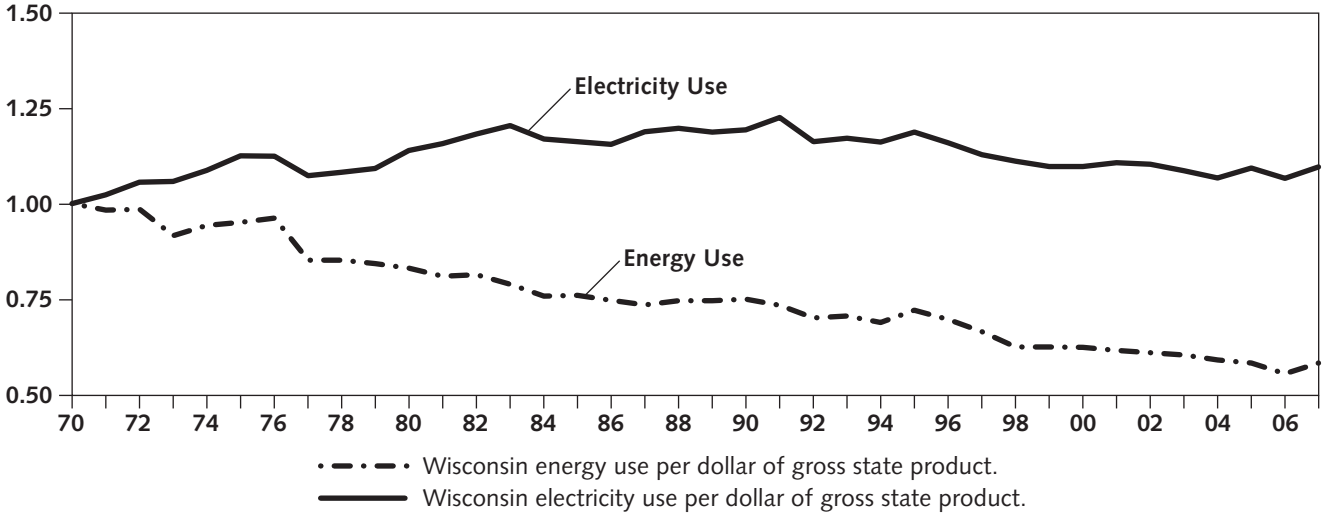
[p] Preliminary data.

Source: Wisconsin Department of Workforce Development, unpublished employment data; U.S. Department of Commerce, *Annual Survey and Census of Manufacturers* http://www.census.gov/mcd/asm-as3.html (1972-2001); households estimated by Wisconsin Department of Administration; Wisconsin Department of Agriculture, Trade and Consumer Protection, *Wisconsin's Agricultural Statistics, 2008*; gross state product; other tables in this publication for total resource energy use and use by sector.

Indices[a] of Wisconsin Energy Efficiency 1970-2007

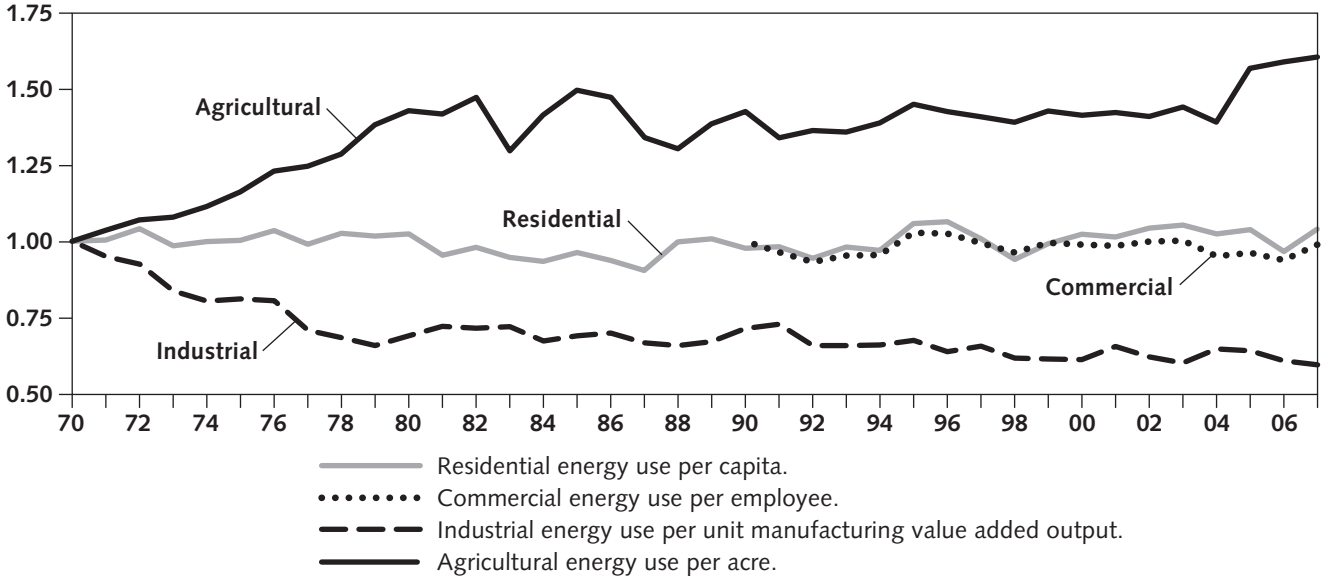
Energy and Electricity Use Per Dollar of Gross State Product

Index: 1970 = 1.0



Energy Indices by Economic Sector

Index: 1970 = 1.0



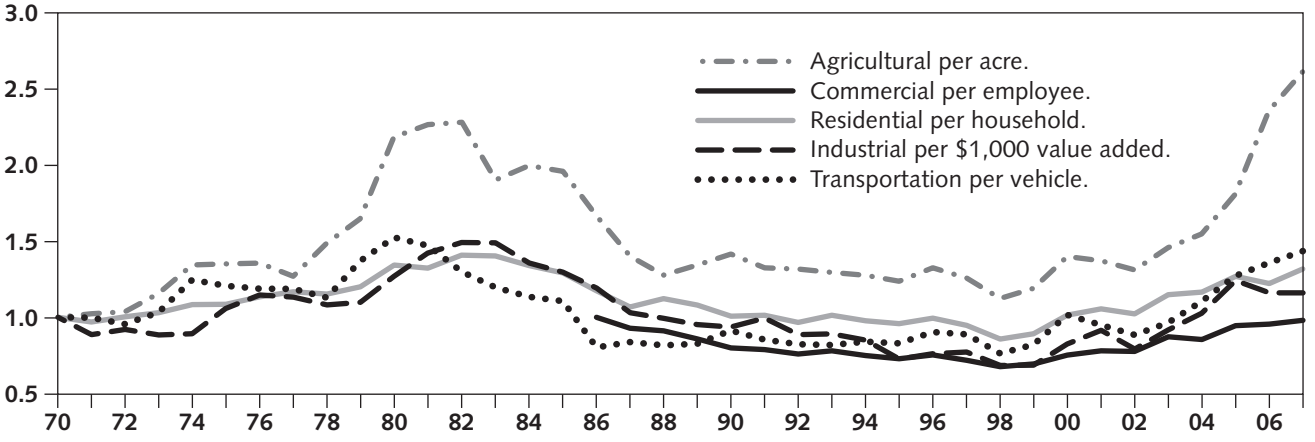
[a] All data, except commercial employment data, normalized to 1.0 in 1970, an arbitrary baseline to which all other years can be compared. Commercial employment data normalized to 1990, when industrial codes changed from SIC to NAICS – see page 126.

Source: Wisconsin Office of Energy Independence.

Indices of Wisconsin Energy Expenditures 1970-2007 (2007 Dollars)

Index: 1970 = 1.0

In 2007, expenditures per vehicle increased 5.6 percent. Commercial expenditures per employee and agricultural expenditures per acre increased by 2.7 and 14.3 percent, respectively. Residential expenditures per household increased by 7.5 percent. Industrial expenditures per $1,000 of value added were level.



Year	Agricultural Expenditures Per Acre	Commercial Expenditures Per Employee[a]	Residential Expenditures Per Household	Industrial Expenditures Per $1,000 Value Added	Transportation Expenditures Per Vehicle
1970	12		1,537	37	1,279
1975	17		1,667	39	1,543
1980	27		2,063	47	1,948
1985	24		1,985	48	1,415
1990	18	1,103	1,544	35	1,168
1995	16	1,004	1,462	27	1,060
2000	19	1,039	1,543	31	1,298
2005	26	1,304	1,930	46	1,628
2006	28	1,318	1,855	43	1,737
2007[p]	**32**	**1,353**	**1,994**	**43**	**1,835**

[a] All data, except commercial employment data, normalized to 1.0 in 1970, an arbitrary baseline to which all other years can be compared. Commercial employment data normalized to 1990, when industrial codes changed from SIC to NAICS – see page 126.

[p] Preliminary estimate.

Source: Compiled from tables in this publication for Wisconsin residential, commercial, industrial, agricultural and transportation energy use.

Wisconsin Per Capita Resource Energy Consumption, by Type of Fuel, 1970-2007

(Millions of Btu)

Wisconsin's per capita resource energy consumption increased 3.2 percent in 2007. However, compared to the low point in 1982, 2007 per capita energy use in Wisconsin rose 22 percent.

Year	Petroleum	Natural Gas	Coal	Renewable	Nuclear	Electric Imports[a]	Total
1970	103.6	74.7	80.4	7.4	0.4	-6.4	260.1
1975	104.0	80.0	57.4	7.9	24.3	-4.5	269.2
1980	96.6	73.2	69.0	12.3	22.7	-1.4	272.4
1982	85.3	65.9	67.6	12.9	23.5	2.3	257.4
1985	86.8	64.3	78.9	13.5	25.0	-0.4	268.2
1990	90.9	62.6	84.1	13.1	24.8	19.1	294.5
1995	92.6	74.2	90.3	13.4	23.1	25.2	318.9
2000	94.6	73.1	96.8	12.1	23.1	18.9	318.6
2001	94.3	66.7	96.6	12.9	23.0	22.8	316.3
2002	95.4	70.6	93.4	13.4	24.7	18.8	316.4
2003	95.5	72.0	96.3	13.4	24.1	16.1	317.4
2004	96.6	69.3	97.5	13.7	23.3	17.1	317.5
2005	94.2	74.4	96.0	14.3	14.8	21.6	315.4
2006	92.7	67.2	92.6	14.2	23.8	13.8	304.3
2007[p]	**92.1**	**70.7**	**92.1**	**14.2**	**23.4**	**21.3**	**313.9**

[a] "Electric Imports" is the estimated resource energy used in other states or Canada to produce the electricity imported into Wisconsin. This resource energy is estimated assuming 11,300 Btu of resource energy per kWh imported into Wisconsin. A negative sign indicates that resource energy was used in Wisconsin to produce electricity that was exported.

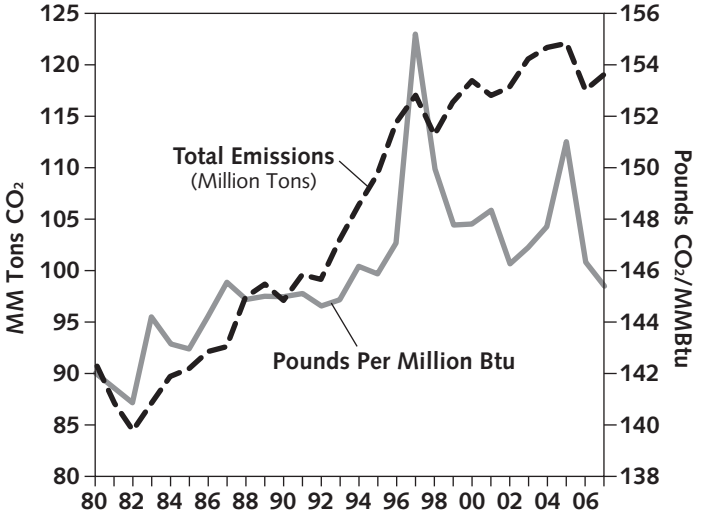
[p] Preliminary estimates.

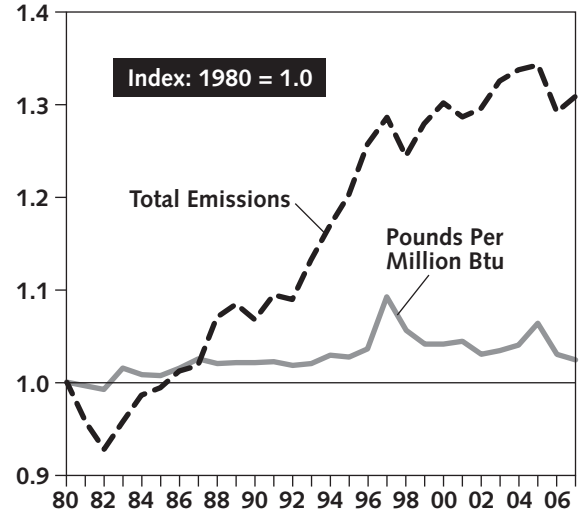
Source: Compiled from tables in this publication for Wisconsin petroleum, natural gas, coal and renewable energy use, electric imports and population.

Wisconsin Carbon Dioxide Emissions from Energy Use 1980-2007[a]

(Millions of Tons and Pounds Per Million Btu)

Wisconsin's CO_2 emissions from energy increased 1.5 percent in 2007. Since 1990, total CO_2 emissions have increased 22.5 percent. 2007 levels of CO_2 emissions are slightly higher than 2000 levels.





Year	Tons CO_2 (Millions)	Pounds CO_2 Per MMBtu
1980	91.0	141.2
1985	90.4	141.9
1990	97.0	144.0
2000	118.4	147.3
2001	116.9	147.6
2002	117.8	145.5
2003	120.5	146.2
2004	121.6	147.0
2005	122.0	150.0
2006	117.4	145.5
2007[p]	**119.0**	**145.5**

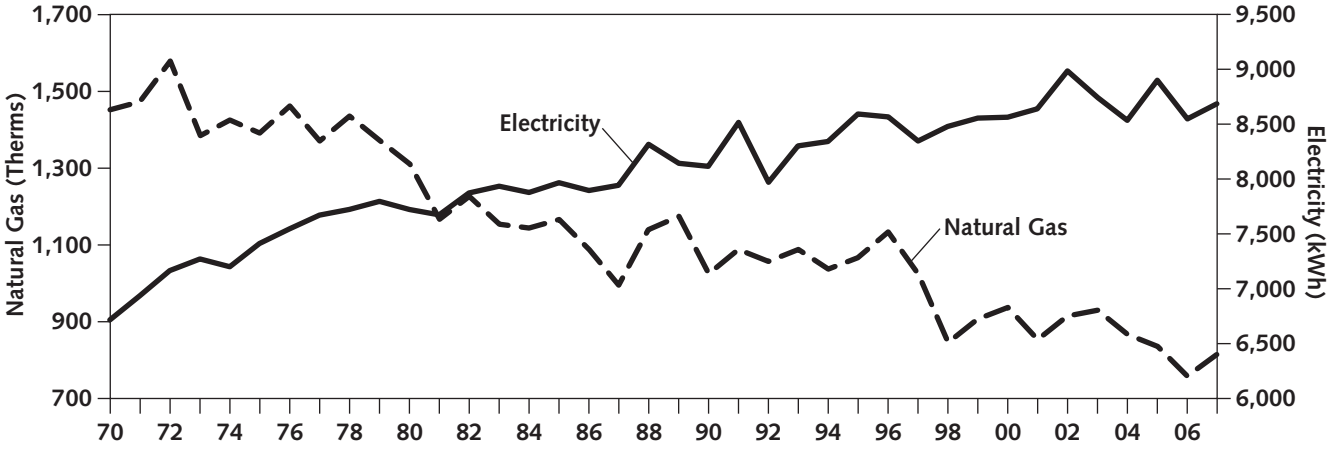
[a] Does not include electric imports.

[p] Preliminary estimates.

Source: Compiled from tables in this book for fuel use, and U.S. EPA emission factors.

Wisconsin Residential Electricity and Natural Gas Use Per Customer, 1970-2007

Electricity use per customer increased 1.6 percent in 2007, while natural gas use increased 7.5 percent.



Year	Natural Gas[a]		Electricity[b]	
	Number of Customers (Thousands)	Use Per Customer (Therms)	Number of Customers (Thousands)	Use Per Customer (kWh)
1970	754.5	1,450	1,429	6,711
1975	857.9	1,389	1,607	7,407
1980	951.3	1,309	1,801	7,716
1985	1,010.8	1,164	1,870	7,960
1990	1,122.1	1,022	2,017	8,109
1995	1,291.4	1,065	2,170	8,586
2000	1,458.0	935	2,329	8,557
2001	1,484.5	851	2,365	8,634
2002	1,514.7	913	2,404	8,976
2003	1,541.5	928	2,445	8,736
2004	1,569.7	865	2,486	8,526
2005	1,592.6	834	2,526	8,890
2006	1,611.8	756	2,550	8,540
2007[p]	**1,626.6**	**813**	**2,560**	**8,680**

[a] U. S. Department of Energy data.

[b] Edison Electric Institute data.

[p] Preliminary estimates.

Source: Edison Electric Institute, *Statistical Yearbook* (1971-1996); American Gas Association, *Gas Facts* (1971-2000); U.S. Department of Energy, *Electric Sales and Revenues 1993-2000* [DOE/EIA-0540(2000)] (November 2001), *Natural Gas Annual, 1991-2006* [DOE/EIA-0131(06)] (October 2007) and *Natural Gas Monthly* [DOE/EIA-0130 (2008/06)] (June 2008).

Low Income Units Weatherized[a] Through State and Utility Supported Programs, 1980-2007

The transfer of responsibility for low income weatherization from the utilities to the Department of Administration (DOA) was completed on December 31, 2002. Through 2002, some homes received weatherization funding from both DOA and Wisconsin utilities, resulting in the possibility of limited data duplication. The problem of double-counting was eliminated when the program was transferred to DOA. Data duplication problems account for the apparent decline in total homes weatherized between 2000 and 2007.

Year[d]	Department of Administration[b]	Wisconsin Utilities	Combined Totals
1980	5,811	——	5,811
1985	7,355	4,139	11,494
1990	9,302	3,384[c]	12,686
1995	6,126	5,455	11,581
1996	4,575	6,651	11,226
1997	4,530	4,626	9,156
1998	3,854	4,848	8,702
1999	3,703	5,700	9,403
2000[e]	4,246	6,434	10,680
2001	4,867	3,378	8,245
2002	5,948	1,493	7,441
2003	7,368	0	7,368
2004	8,027	0	8,027
2005	8,721	0	8,721
2006	9,057	0	9,057
2007[P]	**10,213**	**0**	**10,213**
Total	**196,713**	**81,227**	**277,940**

[a] Weatherization is any job in which either the state or a utility, or both, installs envelope efficiency measures, appliance efficiency measures, heating equipment replacement/retrofits, or any combination of these.

[b] In July 1992, the Low Income Weatherization Assistance Program was transferred from the Department of Health and Family Services to the Department of Administration.

[c] Estimates.

[d] In 1992, the program year was changed to April-March.

[e] Wisconsin's Public Benefits Program began in October 2000. This program has transitioned responsibility for weatherizing low-income households from the utilities to the Department of Administration, Division of Energy. The transition was completed at the end of December 2002.

[P] Preliminary estimate.

Source: Public Service Commission of Wisconsin, Division of Energy Planning and Programs, unpublished annual data; Wisconsin Department of Health and Family Services, Energy Services Section, unpublished annual data; Department of Administration (DOA), Division of Energy Services, *Annual Weatherization Production*, report to U.S. DOE for 2007, and computerized data which augments this report.

Reported Building Activity Affected by Wisconsin Energy Codes[a], 1979-2007

More than 23,000 buildings were certified in 2007 as meeting Wisconsin's energy efficiency building codes. The codes, developed and enforced by the Wisconsin Department of Commerce or local code officials, establish minimum energy standards for new construction, major renovation and existing rental units.

Year	New One & Two Family Units[b]	New Manufactured Dwelling Units[c,g]	Manufactured Homes (HUD Certified)[f]	Public and Commercial Buildings[d]	Existing Rental Properties[e]	Total
1979	NA	NA		4,332	NA	4,332
1980	3,302	906		3,818	NA	8,026
1985	6,146	1,147		6,380	2,267	15,940
1990	10,286	1,253		7,378	4,849	23,766
1995	12,846	1,991		8,434	6,955	30,226
1996	14,051	2,108		8,088	7,162	31,409
1997	13,390	1,826		7,341	7,488	30,045
1998	14,662	1,856		6,793	7,616	30,927
1999	13,282	2,292		7,387	7,270	30,231
2000	14,799	2,085		6,606	7,510	31,000
2001	14,653	1,926		6,501	6,296	29,376
2002	15,479	1,933		6,516	6,318	30,246
2003	18,851	1,999		6,455	5,136	32,441
2004	18,641	2,141	2,016	6,658	5,221	34,677
2005	19,762	1,962	1,710	6,810	4,948	35,192
2006	14,767	1,596	1,124	8,932	4,181	30,600
2007[p]	**13,393**	**—**	**698**	**6,034**	**3,559**	**23,684**

[a] Includes Chapter Commerce 22 of the Uniform Dwelling Code; Chapter Commerce 63 of the Commercial Building Code; and Chapter Commerce 67 (State Rental Unit Energy Efficiency Standards).

[b] Based on Uniform Dwelling Code permits issued. Through 2004, communities under 2,500 population could opt out from code enforcement and may not have issued permits. Previous numbers may have included some manufactured dwelling units.

[c] Reporting is required for all manufactured dwelling units. These dwelling units meet state standards and are generally delivered to the dwelling site on a flatbed.

[d] Includes new building and alteration plans submitted and approved by the state under general building code provisions. Some projects are exempt from plan review or were locally approved instead.

[e] Properties certified as meeting code requirements during current year, regardless of year of actual transfer of ownership.

[f] These dwelling units meet federal HUD standards, which are lower than state standards, have a chassis and generally are towed to the dwelling site.

[g] From 2007 forward, this category is fully captured in the One and Two Family Dwelling total.

[p] Preliminary.

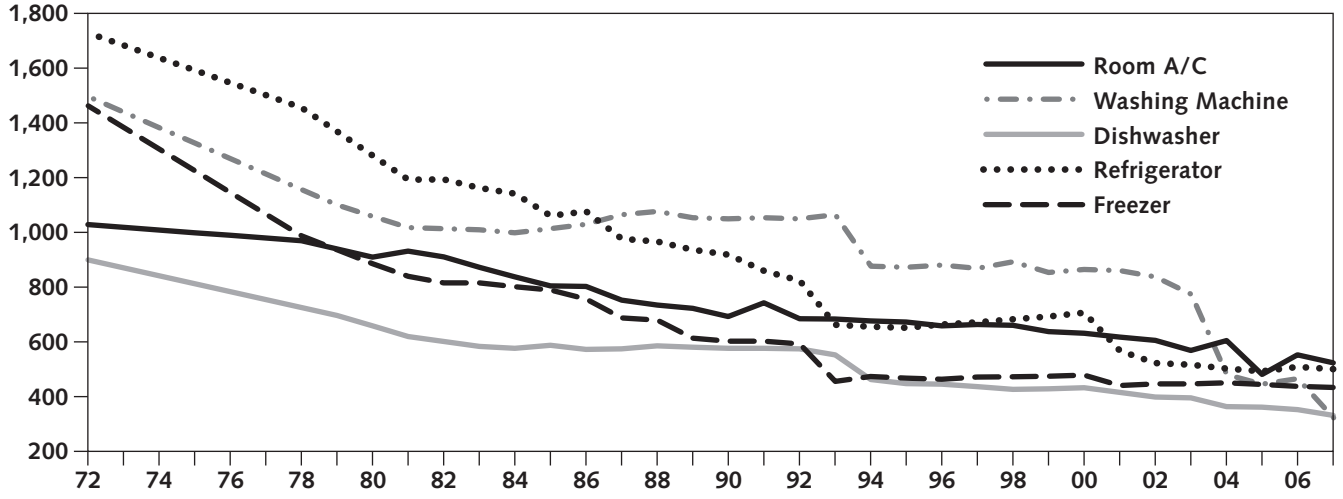
NA – Not applicable. Rental Unit Energy Efficiency Code effective January 1, 1985 and Uniform Dwelling Code Effective June 1, 1980.

Source: Department of Commerce, Division of Safety and Buildings, internal data files.

Energy Consumption by Major New Household Appliances 1972-2007

(kWh Per Year)

Since 1980, energy efficiencies of new household appliances sold in the U.S. have increased from 29 percent to 60 percent, depending upon the appliance. From 1994 to 2000, average efficiencies remained essentially unchanged. However, changes in federal energy efficiency standards since 2000 have reduced average new appliance energy consumption from 8.6 percent for freezers to 46.3 percent for washing machines.



Average Annual New Appliance Energy Consumption (kWh) 1972-2007

Year	Room A/C[a]	Washing Machine[b]	Dishwasher[b]	Refrigerator	Freezer
1972	1,026	1,494	897	1,726	1,460
1980[c]	907	1,056	656	1,278	883
1985	802	1,011	585	1,058	787
1990	690	1,047	574	916	600
1995	670	870	445	649	465
2000	629	862	430	704	476
2005	478	443	359	490	442
2006	550	463	350	506	435
2007[e]	**521**	**321**	**329**	**498**	**431**
ENERGY STAR[d]	**556**	**238**	**334**	**421**	**370**
Best Available[f]	**520**	**126**	**190**	**412**	**316**

[a] Room air conditioner assumes 600 hours per year.

[b] Loads per year: washing machine (392), dishwasher (215) . Energy use assumes electric water heater.

[c] Refrigerator and freezer values estimated.

[d] U.S. Environmental Protection Agency (EPA) Energy Star efficiency values for average size appliance.

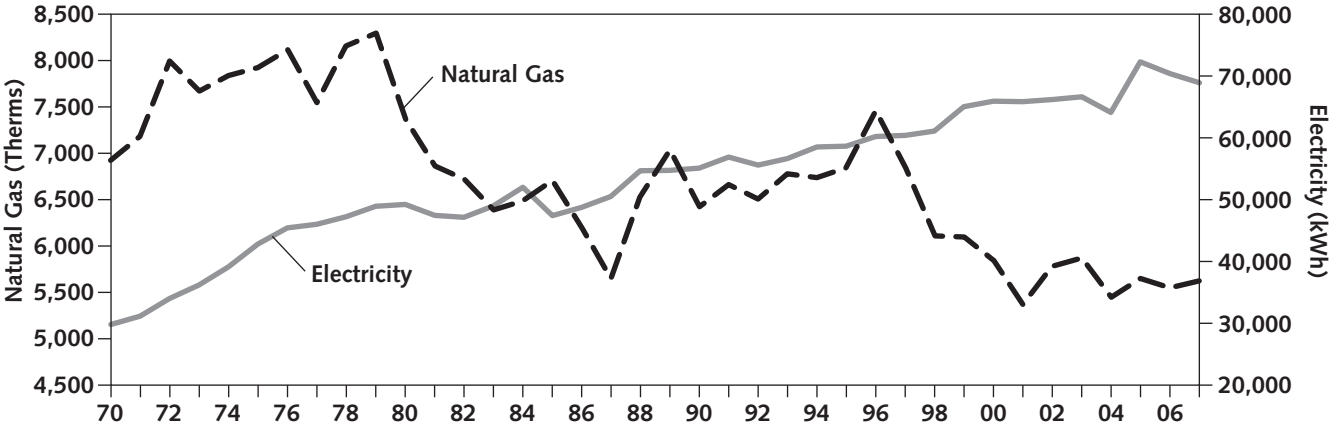
[e] Refrigerator and freezer standards increased July 1, 2001. Air conditioner standards increased October 1, 2000.

[f] Best available (most energy efficient) appliance that can be purchased for the average size sold today.

Source: Association of Home Appliance Manufacturers (AHAM) Information Center.

Wisconsin Commercial Electricity and Natural Gas Use Per Customer, 1970-2007

Commercial electricity use per customer in 2007 decreased 2.1 percent, while natural gas use per customer increased 1.4 percent.



Year	Natural Gas[a]		Electricity[b]	
	Number of Customers (Thousands)	Use Per Customer (Therms)	Number of Customers (Thousands)	Use Per Customer (kWh)
1970	61.0	6,918	167	29,701
1975	72.0	7,917	178	42,709
1980	83.4	7,362	193	49,115
1985	89.3	6,697	224	47,292
1990	104.0	6,413	229	54,990
1995	125.5	6,837	254	58,540
2000	140.3	5,837	278	65,817
2001	144.3	5,357	284	65,741
2002	149.8	5,774	290	66,081
2003	150.1	5,863	301	66,522
2004	151.9	5,438	302	63,963
2005	155.1	5,642	312	72,156
2006	157.7	5,542	324	70,272
2007[p]	**159.7**	**5,617**	**334**	**68,800**

[a] U.S. Department of Energy data for "Commercial" category.

[b] Edison Electric Institute data for "Commercial" category ("Small Light & Power" prior to 1981).

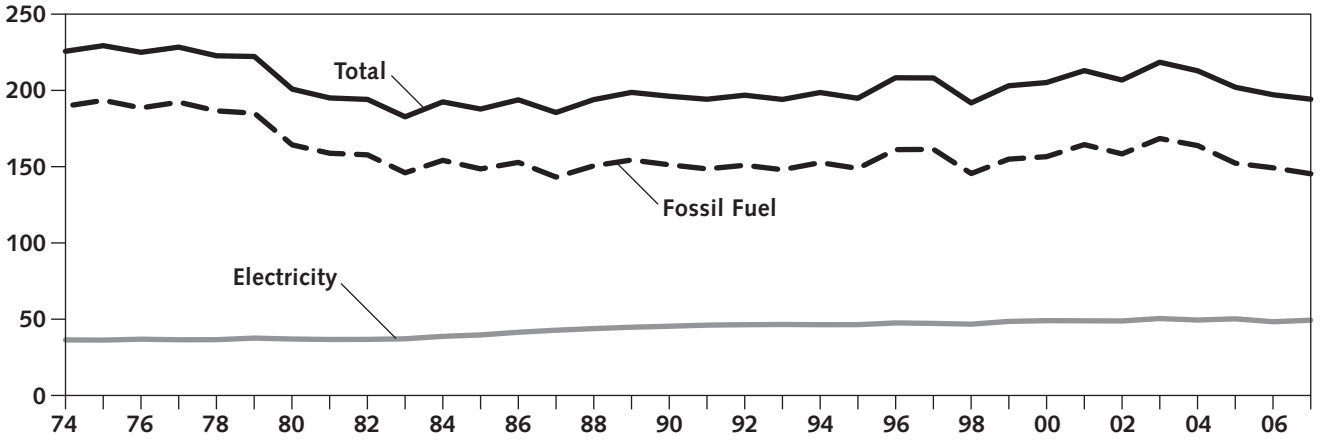
[p] Preliminary estimates.

Source: Edison Electric Institute, Statistical Yearbook (1971-1996); American Gas Association, *Gas Facts* (1971-2000); U.S. Department of Energy, *Electric Sales and Revenues 1993-2000* [DOE/EIA-0540(2000)] (November 2001), *Natural Gas Annual, 1991-2005* [DOE/EIA-0131(06)] (October 2007), and *Natural Gas Monthly* [DOE/EIA-0130 (2008/06)] (June 2008).

Energy Use in State Owned Buildings 1974-2007

(Thousands of Btu Per Gross Square Foot Per Year)

In 2007, total energy use per gross square foot (GSF) decreased 1.5 percent from 2006 levels. Since 1974, fossil fuel use per GSF in state owned buildings has fallen 23.4 percent. Electricity use has increased 35.8 percent per GSF between 1974 and 2007.



Fiscal Year	Fossil Fuel	Electricity[a]	Total Energy[b]	Million Gross Square Feet
1974	189.2	36.0	225.2	42.7
1975	193.0	35.9	228.9	43.6
1980	163.9	36.6	200.4	46.2
1985	148.1	39.2	187.3	47.9
1990	150.8	44.9	195.7	49.7
1995	148.4	46.0	194.4	52.6
2000	156.1	48.6	204.7	55.4
2005[r]	151.8	49.8	201.6	63.5
2006[r]	148.8	47.9	196.7	64.0
2007[p]	**144.9**	**48.9**	**193.8**	**65.3**

[a] Electricity conversion uses 3,413 Btu per kWh.

[b] Data are based on the State Fiscal Year (July 1 – June 30).

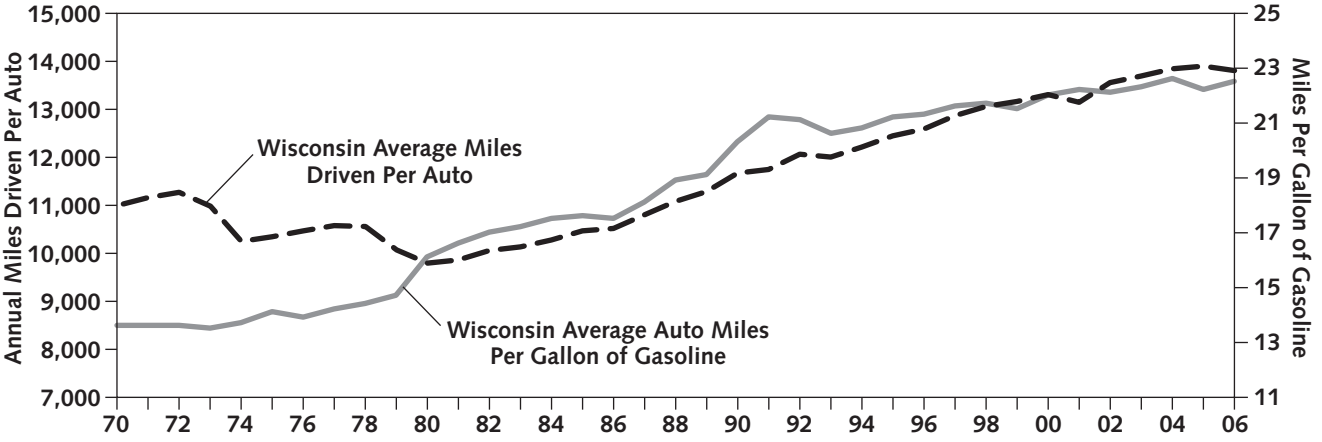
[r] Revised.

[p] Preliminary estimates.

Source: State of Wisconsin, Department of Administration *Energy Use in State Owned Facilities, Report for Fiscal Year 2007*. http://www.doa.state.wi.us/docs_view2.asp?docid=990

Average Miles Driven Per Auto and Average Auto Miles Per Gallon of Gasoline, Wisconsin and United States[a], 1970-2006

The average number of miles driven annually per automobile in Wisconsin decreased slightly in 2006. It is nearly 41 percent higher than in 1980 and 11 percent higher than the U.S. average. Fuel efficiency has been relatively stagnant since 1991 because of the increasing number of less fuel efficient large cars sold each year. Wisconsin cars were nearly 67 percent more fuel efficient in 2006 than in 1973. Improved mileage since 1999 may be due to new cars able to burn ethanol.



Year	Average Annual Miles Per Auto		Average Auto Miles Per Gallon of Gasoline	
	Wisconsin[b]	U.S.[b]	Wisconsin[b]	U.S.[b]
1970	10,980	9,892	13.6	13.5
1975	10,332	9,309	14.1	14.0
1980	9,782	8,813	16.1	16.0
1985	10,455	9,419	17.6	17.5
1990	11,659	10,504	20.3	20.2
1995	12,435	11,203	21.2	21.1
2000	13,293	11,976	22.0	21.9
2001	13,132	11,831	22.2	22.1
2002	13,544	12,202	22.1	22.0
2003	13,681	12,325	22.3	22.2
2004	13,831	12,460	22.6	22.5
2005[r]	13,886	12,510	22.2	22.1
2006[p]	**13,794**	**12,427**	**22.5**	**22.4**

[a] Wisconsin and U.S. figures come from different sources and may not be directly comparable.

[b] Does not include minivans, pickups or sport utility vehicles.

[p] Preliminary estimates.

[r] Revised.

Source: Wisconsin Department of Transportation, Division of Planning and Budget, Bureau of Policy Planning and Analysis, personal communication (1993); U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review* [DOE/EIA-0035 (2008/02)] (February 2008) http://www.eia.doe.gov/emeu/mer/.